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| APPLICATION NO. | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
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| 09/970,283 | 09/27/2001 | John F. Cooper | IL-10479 | 9097 |

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EXAMINER

PARSONS, THOMAS H

ART UNIT

PAPER NUMBER

1745

DATE MAILED: 07/30/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/970,283

Applicant(s)

COOPER ET AL.

Examiner

Thomas H Parsons

Art Unit

1745

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 27 September 2001.
- 2a) ☐ This action is FINAL. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-84 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) 9-84 is/are allowed.
- 6) ☒ Claim(s) 1,2 and 4-8 is/are rejected.
- 7) ☒ Claim(s) 3 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 27 September 2001 is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☒ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) 4.
- 4) ☐ Interview Summary (PTO-413) Paper No(s) _____.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other:

DETAILED ACTION

Drawings

1. The drawings are objected to as failing to comply with 37 CFR 1.84(p)(5) because they do not include the following reference sign(s) mentioned in the description: "12" as mentioned on page 4, line 4. A proposed drawing correction or corrected drawings are required in reply to the Office action to avoid abandonment of the application. The objection to the drawings will not be held in abeyance.

Claim Objections

2. Claims 5 and 26 objected to because of the following informalities:

Claim 5, line 3, suggest inserting "of" after the first occurrence of "products"; and,

Claim 26, suggest renumbering the second occurrence of "claim 26" to --claim 27--.

Appropriate correction is required.

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

4. Claim 1 are rejected under 35 U.S.C. 103(a) as being unpatentable over Sklarchuk (3,988,163) above, and further in view of JP10-199533.

Art Unit: 1745

Claim 1: Sklarchuk in Figure 1 discloses a high temperature, molten electrolyte electrochemical cell comprising: carbon particles (col. 4: 39-col. 5: 3)

Sklarchuk does not disclose ash-free, turbostratic carbon particles having a maximum diameter of less than one micrometer.

JP10-199533 discloses ash-free, turbostratic carbon particles (i.e. a disturbed layer structure or selective orientation, low crystallinity and small crystal size) having a maximum diameter of less than one micrometer (abs.) and para. [0034] through [0039]).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have substituted the carbon particles of Sklarchuk with the carbon particles of JP10-199533 because JP10-199533 teaches carbon particles that would have provided an excellent charge/discharge repeat property thereby improving the overall life and performance of the device.

Claim 2: The Sklarchuk combination (see Sklarchuk, Figure 1) discloses that the electrochemical cell is a battery.

Claim 4: The rejection is as set forth above in claim 1 wherein further JP10-199533 discloses that the carbon particles have an x-ray diffraction d (002) line that is greater than about 0.34 nanometers (para. [0016] which discloses 20A-1000A which equates to 2-100 nanometers).

Claim 5: The rejection is as set forth above in claim 1 wherein further JP10-199533 discloses that the carbon particles are selected from the group consisting of pyrolysis products of substantially pure hydrocarbons (paras. [0018] and [0035]).

Art Unit: 1745

Claims 6 and 7: The rejection is as set forth above in claim 1 wherein further JP10-199533 discloses that the substantially pure hydrocarbon contains an alkyne, and that the substantially pure hydrocarbon contains is acetylene (paras. [0018] and [0035]).

Claim 8: The Sklarchuk combination discloses that the carbon particles are entrained in said molten electrolyte (Sklarchuk, col. 4: 55-56).

Allowable Subject Matter

5. Claims 9-84 are allowable over the prior art of record.
6. Claim 3 is objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Reasons for Indicating Allowable Subject Matter

7. The following is a statement of reasons for the indication of allowable subject matter:

The prior art of record discloses high temperature, molten electrolyte electrochemical cell comprising: a cathode compartment having a slurry comprising said molten electrolyte and carbon particles entrained in said molten electrolyte; and, an anode compartment having molten electrolyte wherein the cell produces sodium ions which react to produce sodium sulfite (Na_2S_x).

In contrast, instant invention requires a cathode compartment having an oxygen-containing gas and a molten electrolyte; an anode compartment having a slurry comprising said molten electrolyte and carbon particles entrained in said molten electrolyte wherein the cell produces carbonate ions which react with carbon fuel.

Art Unit: 1745

Therefore, a search of the prior art of record failed to reveal or explicitly teach, alone or in combination, what is instantly claimed: in particular,

A high temperature, molten electrolyte electrochemical cell for directly converting a carbon fuel to electrical energy, the electrochemical cell comprising: a cathode compartment having an oxygen-containing gas and a molten electrolyte; an anode compartment having a slurry comprising said molten electrolyte and carbon particles entrained in said molten electrolyte; and an electron insulating, ion conducting, porous ceramic separator between said cathode compartment and said anode compartment. For this reason, claim 9 and claims 10-24, which are dependent thereon, are patentably distinct from the prior art of record.

A high temperature, molten electrolyte electrochemical cell for directly converting a carbon fuel to electrical energy, the electrochemical cell comprising: a cathode compartment formed by a housing comprising non-porous, inert material having a gas inlet and a gas outlet, an oxygen-containing gas, a molten electrolyte, and a cathode current collector; an anode compartment having an inlet, an anode current collector, and a slurry comprising said molten electrolyte and a plurality of carbon particles entrained in said molten electrolyte; and an electron insulating, ion conducting, porous ceramic separator between said cathode compartment and said anode compartment, said porous ceramic separator capable of allowing transport of ions produced in said cathode compartment to said slurry. For this reason, claim 25 and claims 26-52, which are dependent thereon, are patentably distinct from the prior art of record.

A method for producing electrical energy comprising the steps of: heating an electrochemical cell containing a carbon fuel entrained in an electrolyte to an operating temperature causing the electrolyte to become molten, said electrolyte containing at least one

Art Unit: 1745

carbonate; producing carbonate ions by bringing an oxygen-containing gas in contact with a cathode current collector wetted with the molten electrolyte; transporting said carbonate ions through a porous ceramic separator to an anode current collector causing said carbonate ions to react with said carbon fuel; and collecting said electrical energy produced through said anode current collector. For this reason, claim 53 and claims 54-84, which are dependent thereon, are patentably distinct from the prior art of record.


Any inquiry concerning this communication or earlier communications from the examiner should be directed to Thomas H Parsons whose telephone number is (703) 306-9072. The examiner can normally be reached on M-F (7:00-4:30) First Friday Off.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Pat Ryan can be reached on (703) 308-2383. The fax phone numbers for the organization where this application or proceeding is assigned are (703) 872-9310 for regular communications and (703) 872-9311 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0661.

Thomas H Parsons
Examiner
Art Unit 1745

July 16, 2003


Patrick Ryan
Supervisory Patent Examiner
Technology Center 1700
Supervisor
Technology Center 1700